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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Jin-gyo SEO et al.

Serial No. 09/609,822 Group Art Unit: 2652

Confirmation No. 2532

Filed: July 3, 2000 Examiner: Michael V. Battaglia

For: ADAPTIVE WRITING METHOD FOR HIGH-DENSITY OPTICAL RECORDING APPARATUS AND CIRCUIT THEREOF

SUBMISSION OF ENGLISH TRANSLATION

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Attached are verified English translations for Korean Patent Application No. 1997-77746, filed December 30, 1997; Korean Patent Application No. 1998-29732, filed July 23, 1998 and Korean Patent Application No. 1998-4071, filed February 11, 1998. It is respectfully requested that the attached English translations be made of record in the above-identified application to perfect the foreign filing dates.

If any further fees are required in connection with the filing of this English Translation, please charge same to our Deposit Account No. 19-3935.

Respectfully submitted,
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IN THE MATTER OF

U.S. Patent Application No. 09/609,822

By Samsung Electronics Co., Ltd.

I, Soon-hee Lee, an employee of Y.P.LEE,MOCK & PARTNERS of The Cheonghwa Bldg., 1571-18 Seocho-dong, Seocho-gu, Seoul, Republic of Korea, hereby declare that I am familiar with the Korean and English languages and that I am the translator of the priority document (Korean Patent Application No. 1997-77746) and certify that the following is to the best of my knowledge and belief a true and correct translation.

Signed this 14th day of September 2004.

Soon hee Lee

ABSTRACT

[Abstract of the Disclosure]

An adaptive write pulse generating method for an optical recording apparatus is provided. The method includes preparing a shift width table storing information on the shift widths of the first pulse and the last pulse of a write pulse in accordance with the combinations of input NRZI data signals; generating the write pulse; calculating a combination of the magnitude of a present mark and the magnitudes of a leading space and a trailing space from the NRZI data signals; reading the shift widths of the first pulse and the last pulse from the shift width table; and adaptively adjusting the widths of the first pulse and the last pulse of the write pulse corresponding to the present mark depending on the shift width values.

It is possible to minimize the time variable by varying the widths of the first pulse and the last pulse of the write pulse in accordance with the combination of the input NRZI data signals. In addition, the size of a hardware added to minimize the time variable can be reduced.

[Representative Drawing]

FIG. 3

SPECIFICATION

[Title of the Invention]

Adaptive Write Pulse Generating Method for Optical Recording Apparatus

[Brief Description of the Drawings]

FIG. 1A is a waveform diagram of input NRZI data signals;

FIG. 1B is a waveform diagram of a conventional write pulse;

FIG. 1C is a waveform diagram of a read power;

FIG. 1D is a waveform diagram of a peak power;

FIG. 1E is a waveform diagram of an erase power;

FIG. 1F is a waveform diagram of the present invention;

FIG. 2 is a shift width table illustrating 27 combinations of pulses according to an embodiment of the present invention; and

FIG. 3 is a flowchart of an adaptive write pulse generating method according to the present invention.

[Detailed Description of the Invention]

[Object of the Invention]

[Technical Field of the Invention and Related Art prior to the Invention]

The present invention relates to an optical recording apparatus and more particularly, to an adaptive write pulse generating method for the optical recording apparatus.

With the multi-media era requiring high-capacity recording media, optical recording systems employing high-capacity recording media, such as a magnetic optical disc drive (MODD) or a digital versatile disc random access memory (DVD-RAM) drive, have been widely used. As the recoding density increases, such optical recording systems require optimal and high-precision states.

Conventionally, a write pulse is formed as specified in the format book shown in FIGS. 1A-1E and data are written. FIG. 1A shows NRZI (Non-Return to Zero

Inversion) data signals. FIG. 1B shows a write pulse, a combination of the read power of FIG. 1C, the peak power of FIG. 1D, and the erase power of FIG. 1E.

However, in the case of writing data by forming the write pulse as shown in FIG. 1B, with combinations of input NRZI data signals, time variable (to be referred to as jitter, hereinafter) occurs. The jitter is one of major factors lowering the performance of optical recording apparatuses.

[Technical Goal of the Invention]

To solve the above problems, it is an objective of the present invention to provide an adaptive write pulse generating method for minimizing jitter by the addition of a limited-sized hardware.

Accordingly, to achieve the objective, there is provided an adaptive write pulse generating method for an optical recording apparatus comprising preparing a shift width table storing information on the shift widths of the first pulse and the last pulse of a write pulse in accordance with the combinations of input NRZI data signals; generating the write pulse; calculating a combination of the magnitude of a present mark and the magnitudes of a leading space and a trailing space from the NRZI data signals; reading the shift widths of the first pulse and the last pulse from the shift width table; and adaptively adjusting the widths of the first pulse and the last pulse of the write pulse corresponding to the present mark depending on the shift width values.

[Structure and Operation of the Invention]

Hereinafter, the present invention will be described in more detail with reference to the accompanying drawings.

The jitter of the write waveform of FIG. 1B is determined depending on a combination of the magnitudes of the present mark, the leading space, and the trailing space of the NRZI data signals of FIG. 1A.

DVD RAM uses 8/16 modulation according to code system. When the cycle of the reference pulse is designated T, the magnitude of the shortest pulse of the NRZI

data signal is 3T and the magnitude of the longest pulse is 14T. Therefore, in order to minimize the jitter of the present mark, the magnitudes of the leading space and the trailing space must be calculated. That is, when the magnitude of the present mark in FIG. 1A is 5T, the magnitude of the front-part space corresponding to the leading pulse is 3T and the magnitude of the rear-part space corresponding to the trailing pulse is 11T.

Considering all combinations, a shift width table in which jitters for $(14\text{-}3+1\text{-}2)^3=1000$ possible combinations are stored are required. With respect to all the cases, the system is complicated, excess cost incurs due to increase of an added hardware. Therefore, such a system is inapplicable.

Therefore, in one embodiment of the present invention, the magnitudes of input NRZI data signals are grouped into a short pulse group, a middle pulse group and a long pulse group and thus a shit width table storing the jitters for $3^3=27$ representative pulse combinations is used.

FIG. 2 shows 27 combinations for information on the shift widths of the first pulse and the last pulse of the write pulse in the shift width table used according to one embodiment of the present invention.

FIG. 3 shows a flowchart of an adaptive write pulse generating method according to the present invention.

First, a shift width table storing information on the shift widths of the first pulse and the last pulse of a write pulse in accordance with the combinations of input NRZI data signals is prepared.

The write pulse is generated by a combination of a read power, a peak power, and an erase power (step 300).

A combination of the magnitude of a present mark and the magnitudes of a leading space and a trailing space is calculated from the NRZI data signals (step 310). In this case, the magnitude of each pulse in the combination is grouped into a short pulse, a middle pulse, and a long pulse, thereby preparing 27 representative combinations.

The shift widths of the first pulse and the last pulse are read from the shift width table using the representative combinations (step 320).

Finally, the widths of the first pulse and the last pulse of the write pulse corresponding to the present mark depending on the shift width values read in step 320 are adaptively adjusted (step 330).

The adaptively adjusted write pulse obtained according to the above method is shown in FIG. 1F.

[Effect of the Invention]

As described above, the widths of the first and last pulses of a write pulse waveform are varied in accordance with the combinations of input NRZI data, thereby minimizing jitter.

Also, the size of a hardware added to minimize jitter can be reduced.

What is claimed is:

1. An adaptive write pulse generating method for an optical recording apparatus comprising:

preparing a shift width table storing information on the shift widths of the first pulse and the last pulse of a write pulse in accordance with the combinations of input NRZI data signals;

generating the write pulse;

calculating a combination of the magnitude of a present mark and the magnitudes of a leading space and a trailing space from the NRZI data signals;

reading the shift widths of the first pulse and the last pulse from the shift width table; and

adaptively adjusting the widths of the first pulse and the last pulse of the write pulse corresponding to the present mark depending on the shift width values.

2. The adaptive write pulse generating method according to claim 1, wherein in the step of generating the write pulse, the write pulse is generated by a combination of a read power, a peak power, and an erase power.

3. The adaptive write pulse generating method according to claim 1, wherein the shift width table is a table comprised of 27 combinations in which the magnitudes of the present mark, the leading space, and the trailing space are separately grouped into a short pulse, a middle pulse, and a long pulse, respectively.

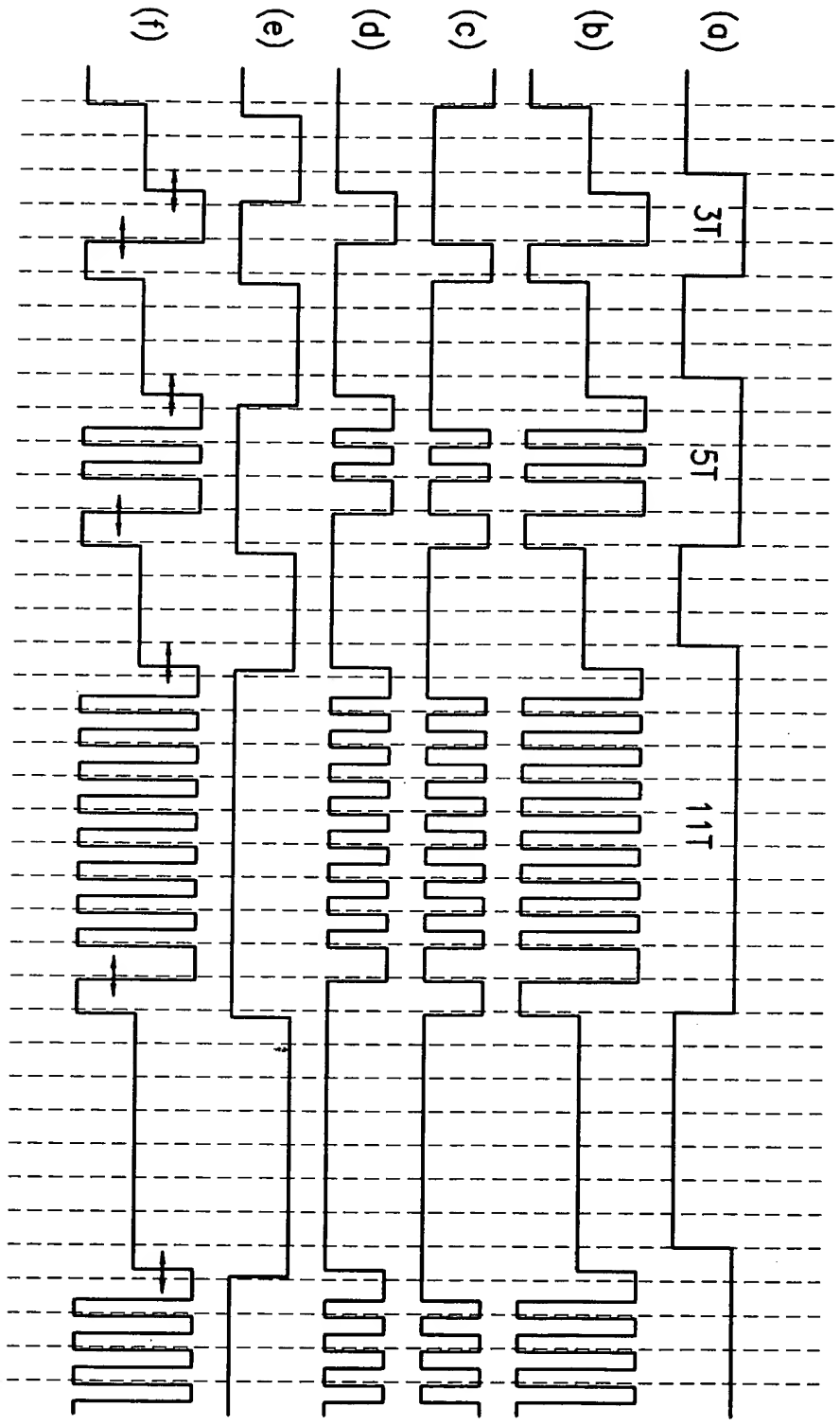

FIG. 1

FIG. 2

LEADING PULSE (SPACE)	PRESENT MARK	TRAILING PULSE (SPACE)
SHORT PULSE	SHORT PULSE	SHORT PULSE
SHORT PULSE	SHORT PULSE	MIDDLE PULSE
SHORT PULSE	SHORT PULSE	LONG PULSE
SHORT PULSE	MIDDLE PULSE	SHORT PULSE
SHORT PULSE	MIDDLE PULSE	MIDDLE PULSE
SHORT PULSE	MIDDLE PULSE	LONG PULSE
SHORT PULSE	LONG PULSE	SHORT PULSE
SHORT PULSE	LONG PULSE	MIDDLE PULSE
SHORT PULSE	LONG PULSE	LONG PULSE
MIDDLE PULSE	SHORT PULSE	SHORT PULSE
MIDDLE PULSE	SHORT PULSE	MIDDLE PULSE
MIDDLE PULSE	SHORT PULSE	LONG PULSE
MIDDLE PULSE	MIDDLE PULSE	SHORT PULSE
MIDDLE PULSE	MIDDLE PULSE	MIDDLE PULSE
MIDDLE PULSE	MIDDLE PULSE	LONG PULSE
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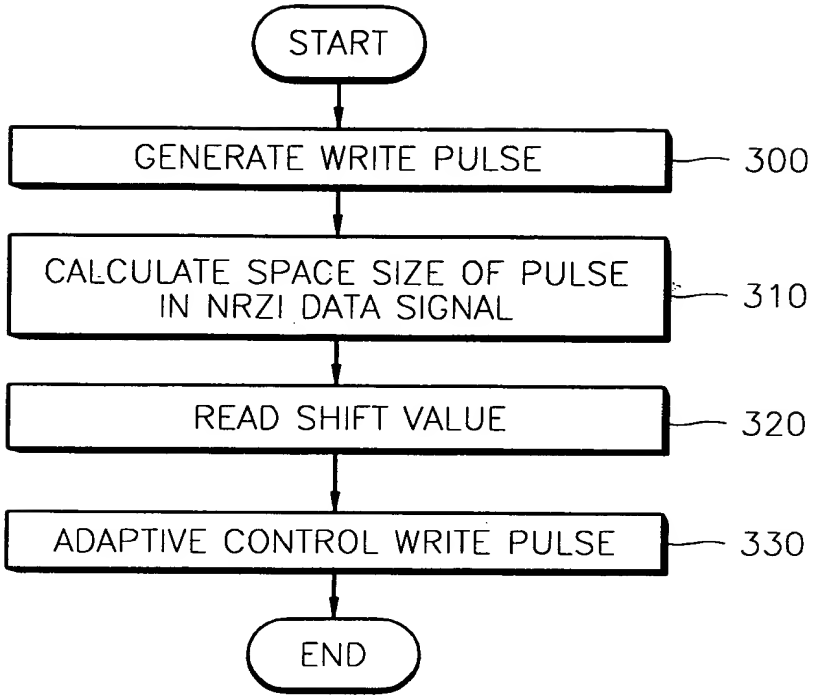
LONG PULSE	SHORT PULSE	MIDDLE PULSE
LONG PULSE	SHORT PULSE	LONG PULSE
LONG PULSE	MIDDLE PULSE	SHORT PULSE
LONG PULSE	MIDDLE PULSE	MIDDLE PULSE
LONG PULSE	MIDDLE PULSE	LONG PULSE
LONG PULSE	LONG PULSE	SHORT PULSE
LONG PULSE	LONG PULSE	MIDDLE PULSE
LONG PULSE	LONG PULSE	LONG PULSE

FIG. 3


START
GENERATE WRITE PULSE
300
CALCULATE SPACE SIZE OF PULSE IN NRZI DATA SIGNAL
310
READ SHIFT VALUE
320
ADAPTIVE CONTROL WRITE PULSE
330
END